SOUND-IN-SYNCS
VIDEO PROCESSING AMPLIFIER AM1/578

Introduction

The AM1/578 is used in sound-in-syncs coders[1] to gate pulse-code-modulated sound pulses into the synchronising-pulse period of the video waveform. The sound pulses are shaped within the amplifier to have a sine-squared form and are then gated into the video waveform with their roots at the bottom of syncs. The video signal is clamped at sync bottoms before the gating takes place. If the video signal is absent, standby syncs are fed to the unit so that the sound-in-syncs output can be maintained.

The unit is constructed on an 8·25 x 4·25 inch printed-wiring board with index-pin positions 3, 11 and 15. Input and output connections are made via an ISEP 25-way connector. Power supplies at +12V and −12V are required.

General Specification

Inputs

Video	amplitude 1V p-p nominal
Sound Pulses (from UN23/530)	amplitude about 3·5V p-p, pulse duration at half-amplitude point 50 ns, repetition period 182 ns.
Separated Syncs (from UN16/514)	positive-going, amplitude about 3·5V p-p.
Gated Standby Syncs (from UN16/514)	negative-going, amplitude about 1·8V p-p (present only when the input video signal is absent)
Digit Switch (from UN23/522)	positive-going at line frequency, amplitude about 1V p-p, duration L + 0·100 to L + 4·2 μs

Input Impedances

Video	75 ohms ±3%
Separated Syncs	more than 3 kilohms
Gated Standby Syncs	more than 3 kilohms
Digit Switch	more than 3 kilohms

Output amplitude 1V p-p nominal

Output Impedance 75 ohms ±1%

Distortion

Differential Phase	less than 0·15°
Differential Gain	less than 0·5%

Operating Temperature Range 0°C to +45°C

Power Requirements +12V at 110 mA, −12V at 110 mA

Circuit Description

A block diagram of the AM1/578 is given in Fig.1, a circuit diagram in Fig.2 and waveforms at various points in the circuit in Fig.3.

Input Amplifier and Standby Syncs Inserter

The video input to the unit is applied via a tapped delay line (adjustable in 5 ns steps) to a feedback amplifier comprising transistors TR1, TR2 and TR3. Negative feedback is taken from TR3 emitter to TR1 emitter and the gain of the amplifier (about 1·5 times) is determined by the ratio of R10 to R11 and R12.

If the video input to the unit fails, gated standby syncs which are derived from an associated sync-separator unit[2] are clipped and inverted by TR7 and are then fed to TR4. Transistor TR4 is driven into conduction by the positive-going sync pulses and short-circuits R14. As a result the potential at TP1 falls by an amount which is approximately equal to normal sync pulse amplitude at this point.

Note that standby syncs are present only if the video input fails; they are absent at all other times.

Clamp and Clamp-pulse Generator

The video signal developed at the emitter of TR3 feeds emitter-followers TR5 and TR6, the outputs of which are capacitor-coupled to either end of R24. At the junction of R24 and C9 the signal is clamped to the sync bottoms by the action of transistor TR8; variable resistor R26 provides adjustment of the clamp reference level. Because the coupling circuits are identical the signals applied to either end of R24 have the same a.c. content; any difference in the d.c. component of the two signals is corrected by charge leakage between C8 and C9, via R24.

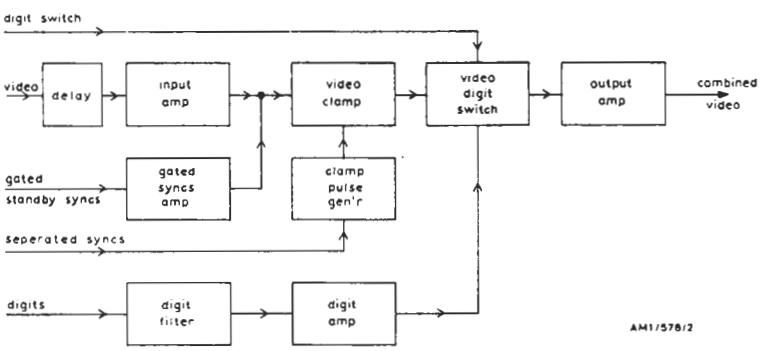


Fig.1 Block Diagram of the AM1/578

The clamped signal is applied via a compound emitter-follower stage comprising transistors TR9 and TR10 to a video/digit switch in which sound information is gated into the sync pulse period.

Positive-going sync pulses are clipped and inverted by TR13 and the resulting signal is differentiated and fed to TR11. The leading edge of the differentiated pulse drives TR11 into cut-off and positive-going clamp pulses are developed at the collector of TR11 and applied to TR8. The clamp pulses have a peak-to-peak amplitude of about 12 volts and a duration of 2 μs.

Digit Filter and Amplifier

The incoming sound pulses are fed, via emitter-followers TR14 and TR15, to a filter circuit

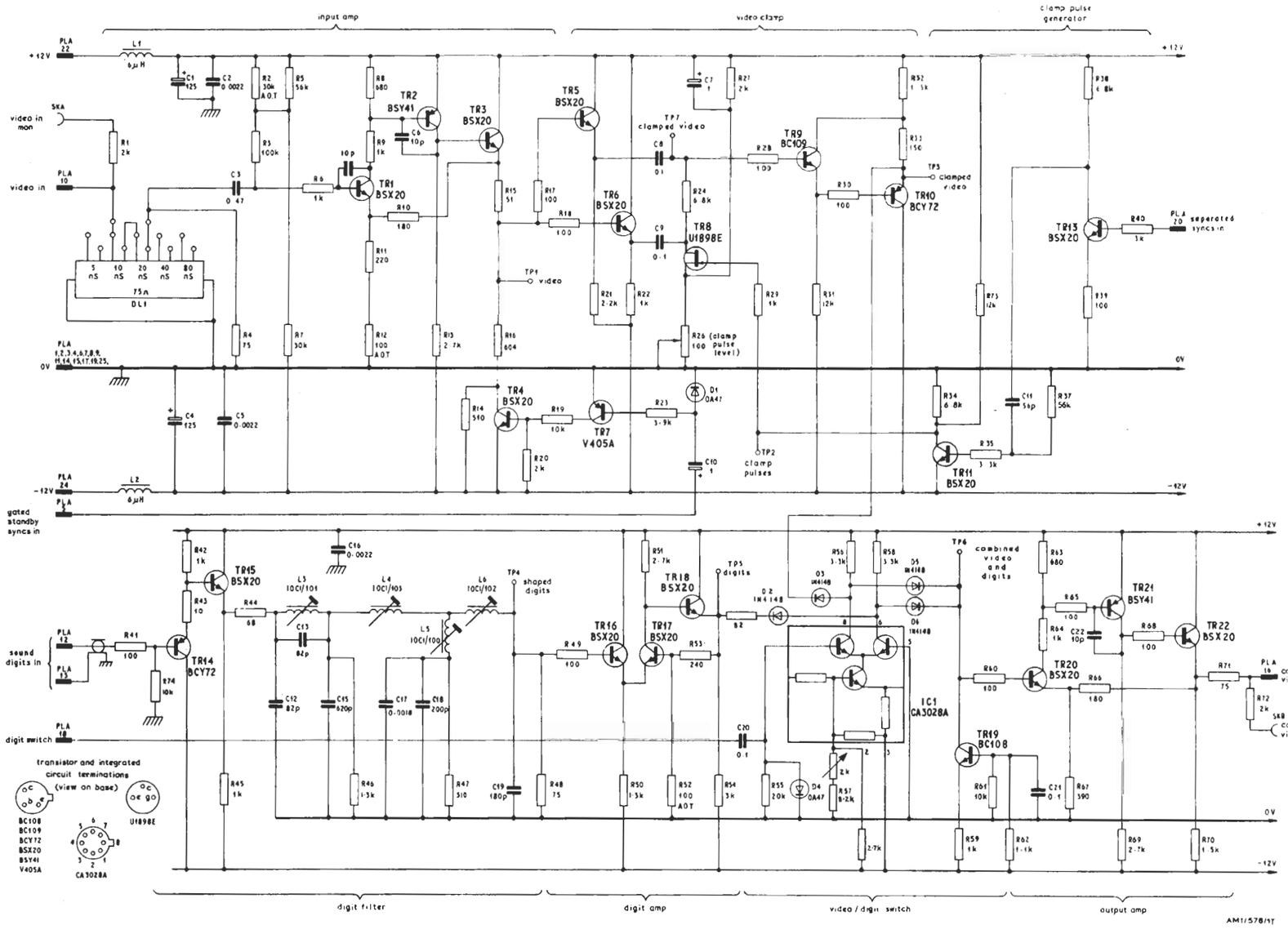


Fig.2. Circuit of the Video Processing Amplifier AM1/578

in which they are given a sine-squared shape. The shaped pulses have an amplitude of about 0·5V peak-to-peak; this is increased to 1·5V in an amplifier formed by transistors TR16, TR17 and TR18. From TR18 the pulses are fed to the video/digit switch.

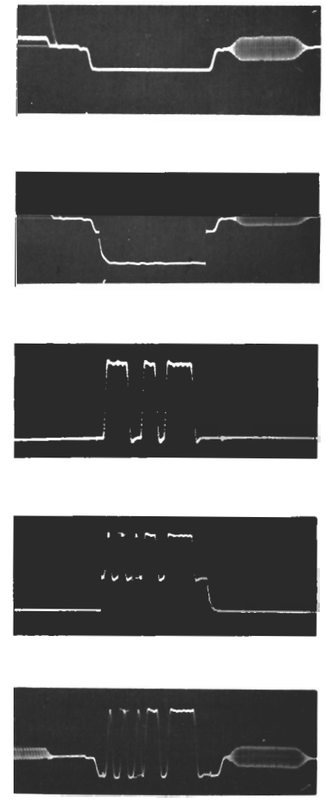
Video/Digit Switch

The video/digit switch consists of four diodes (D2, D3, D5, D6) and integrated circuit IC1. For the greater part of each line period the transistor element associated with terminal 8 of the integrated circuit is cut off, hence diodes D3 and D5 are forward-biased and the video signal is passed without modification to the output stage. However, during sync pulse periods, this transistor element is driven into conduction by a digit-switch pulse and so diodes D3 and D5 are reverse-biased for the duration of each pulse. At the same time diodes D2 and D6 become forward biased and the shaped sound-pulse digits which are present at the emitter of TR18 are fed via these diodes to the output amplifier. Thus the sound information is gated into the sync-pulse periods of the video waveform. Transistor TR19 functions as a constant-current sink for the switch diodes.

Note that the video-digit switch continues to operate throughout the field-blanking period with the result that the duration of alternate equalising pulses is increased to approximately 4·2 μs.

Output Amplifier

The sound-in-syncs output of the video/digit switch is fed to the output of the unit via a feedback amplifier comprising transistors TR20, TR21 and TR22. This amplifier is similar in circuit configuration to the input amplifier.



Note: The precise pattern of the digits shown in waveforms (c), (d) and (e) is of no significance

Fig.3 Waveforms in the AM1/578

Continued on page 5

Alignment and Maintenance

Input Amplifier D.C. Point

Remove the video input signal and measure the voltage at TP1. If necessary adjust R2 to make this voltage 0V ±0·4V.

Video Gain

Apply a suitable video signal to the input of the unit and compare the amplitude of the input and output signals during the active line period. If necessary, adjust R12 to achieve 0 dB gain.

Digit Amplitude

Measure the amplitude of the digit pulses in the output signal. If necessary, adjust R52 to obtain an amplitude of 1V peak-to-peak.

Note that digit-pulse amplitude is affected by digit-pulse duration. Therefore, before making this adjustment, check that the digit pulses at the input have a duration of 50 ns ±1 ns. If the duration is incorrect, check the associated UN23/530 unit.

Video/Digit Relative Sit

See under the alignment of the parent unit[1].

Fault Diagnosis

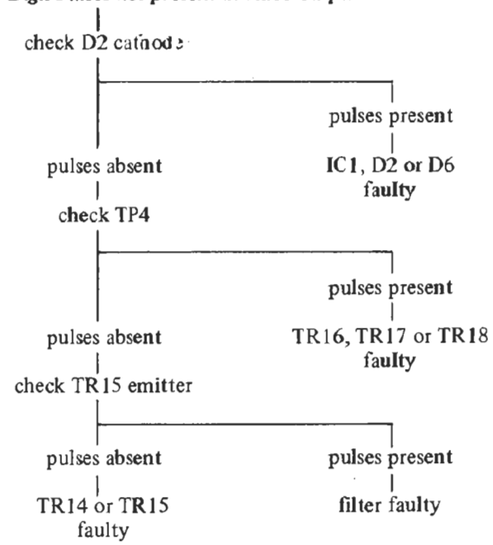
Flow charts are given below to assist in fault location. The charts assume that all input supplies and feeds have been checked and are correct. *Where the comment 'TRxx faulty' is made, this implies that the fault lies either with the transistor itself or with an associated component.*

References to Typical Associated Equipment

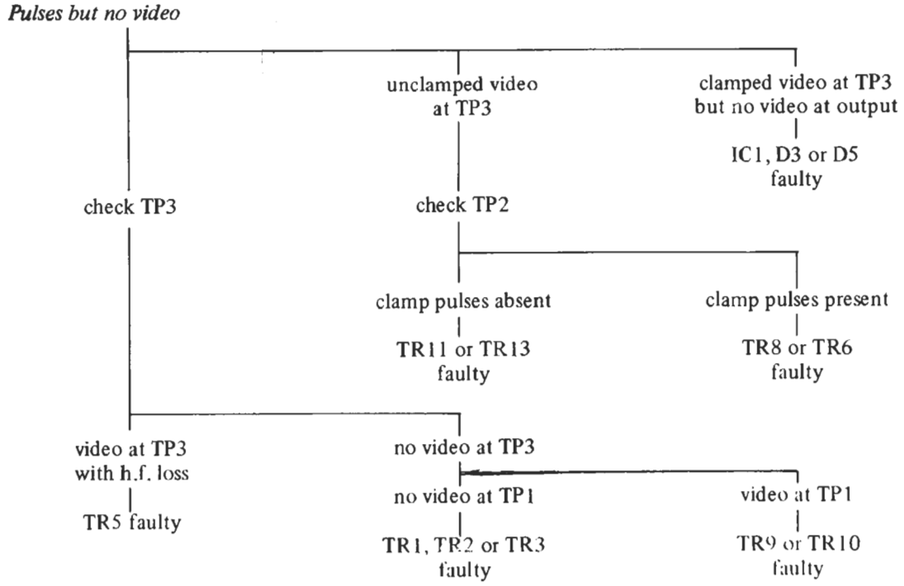
1. Sound-in-syncs Coder CD2M/505
2. Sync Separator Unit UN16/514

TES 8/71

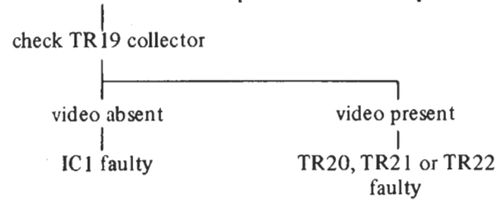
Digit Pulses not present at video output



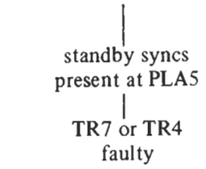
Pulses but no video



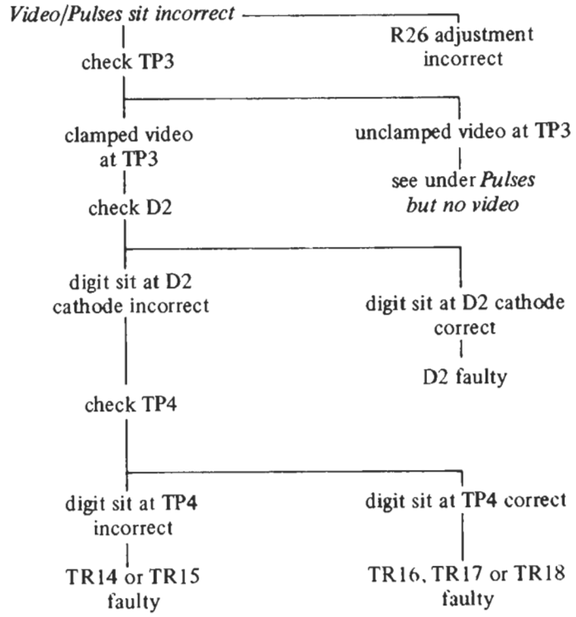
Neither Video nor Pulses present at video output



Syncs Absent in standby condition



Video/Pulses sit incorrect



Mixture of Video and Standby Syncs